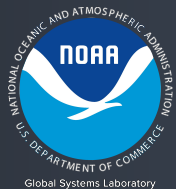NOAA Global Systems Laboratory

# Generating Storm Surge Hazards In Hazard Services: Progress Report

Taylor Trogdon[1], Nathan Hardin[2] Daniel Nietfeld[2], David Tomalak[2], Darrel Kingfield[2], Brian Zachry[3], Jamie Rhome[3], Cody Fritz[3]

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# What Is Hazard Services?

*"A multi-year, multi-phase effort that modernizes how hazardous weather products are generated by the NWS."*

1.) Hazard services for Weather Forecast Offices (WFOs)
2.) **Hazard services for National Centers (NCs)**
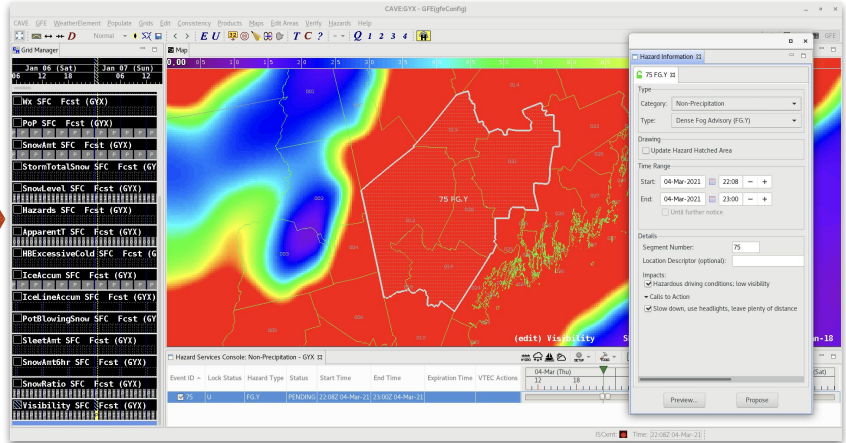3.) Hazard services for Forecasting a Continuum of Environmental Threats (FACETs)
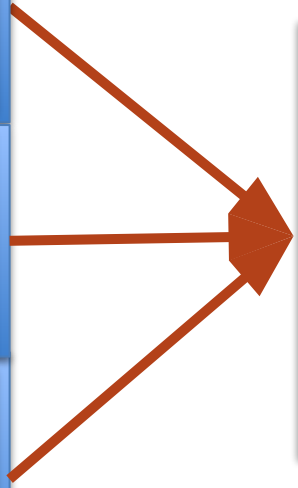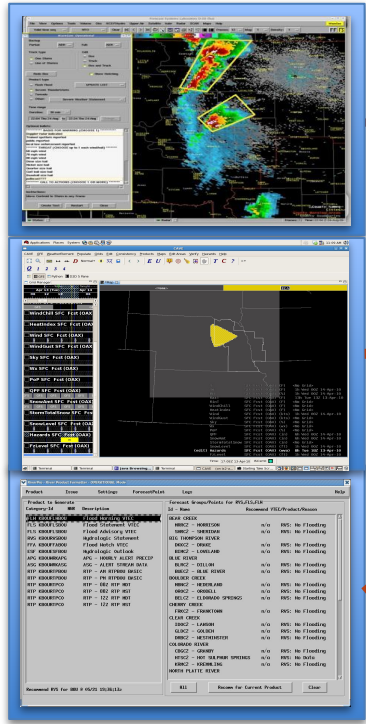
# Hazard Services: The Backbone of a Weather Ready Nation
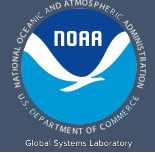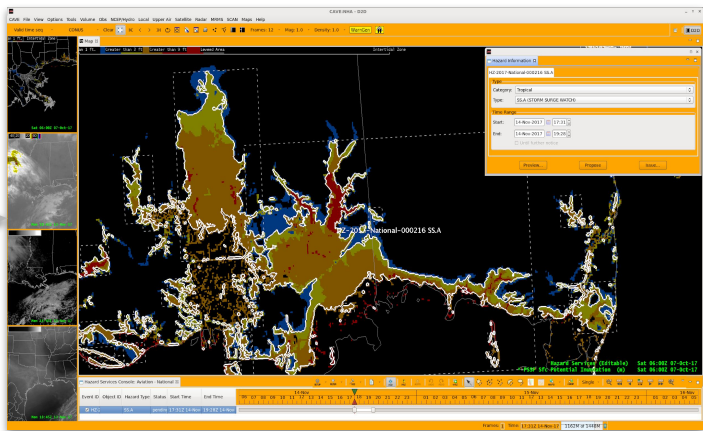


**WarnGen**

**Graphical Hazard Generator**

**RiverPro**

**Hazard Services**

**20-30 Year Old Hazard Forecasting Platforms**

# Recommender Framework

Input Data Source

Hazard Services
Processing

Hazard Event
Output

# Project Background

- ## Funded through JTTI
  - *Joint-Technology Transfer Initiative*
  - Serves to ensure continuous development and transition of technological advances into NWS operations
  - Under the Weather Program Office (WPO) umbrella
- **Principal Investigator:** CSU-CIRA in cooperation with NOAA/ESRL/GSL: Taylor Trogdon
- **Program Managers:** Nathan Hardin, Darrel Kingfeld (NOAA/OAR/ESRL/GSL)
- **NWS Collaborators:** Jamie Rhome (NWS/NCEP/NHC); Ashley Kells (NWS/OPPSD/CP); Daniel Nietfeld (NOAA/ESRL/GSL); Brian Zachry (NWS/NCEP/NHC); Cody Fritz(NWS/NCEP/NHC)
- Project Lifespan:
  - 2-year award - funded through FY22

# Project Purpose

## Modernize the storm surge workflow/migrate into Hazard Services

- **Current operational limitations:**
    - Degraded spatial resolution of the Storm Surge Watch/Warning (2.5km in GFE)
    - Discontinuities between Potential Storm Surge Flooding Graphic (High-resolution inundation mapping) and Storm Surge Watch/Warning
    - Dissemination challenges of hyper-local storm surge threat
        - Current zone-based approach results in over-warning
- **How can Hazard Services help?**
    - Implement polygon-based approach - reduction in geographic extent/overwarning
    - Recommender framework (uses high-resolution inundation graphic to generate first-guess warning)
    - Severity tag capability (warning hierarchy)
    - Common Alerting Protocol (CAP) message generation

# Where Are We?

- Currently *ahead* of schedule
- Beginning RL of 3
- Current RL of 7 (demonstrated software in operational environment)

**Completed Milestones**

| Milestones |
|---|
| 01/2021: Requirements finalized with NHC guidance |
| 04/2021: Google design document delivered to NHC |
| 05/2021: Design approved by Architectural Review Board (ARB) |
| 05/2021: Design presented to NHC |
| 05/2021: New NHC Hazard Type configured in Hazard Services |
| 07/2021: Functional product generation and formatted text product produced by HS |
| 10/2021: Finalize prototype recommender to create first guess hazard extent |
| 10/2021: Demonstrate initial workflow to NHC for evaluation and feedback |
| 02/2022: Updates to software based on testing and evaluation |
| 03/2022: Finalize code and stage code review on VLAB |
| 05/2022: Complete code check-in and merge into HS VLAB repository |
| 05/2022: Final delivery of code via RPM or AWIPS Cloud Instance |
| 08/2022: Final Evaluation of software capabilities and delivery |

# Proposed Forecaster Workflow

Potential Storm Surge Flooding Graphic (PSSFG) ingested into AWIPS as netcdf
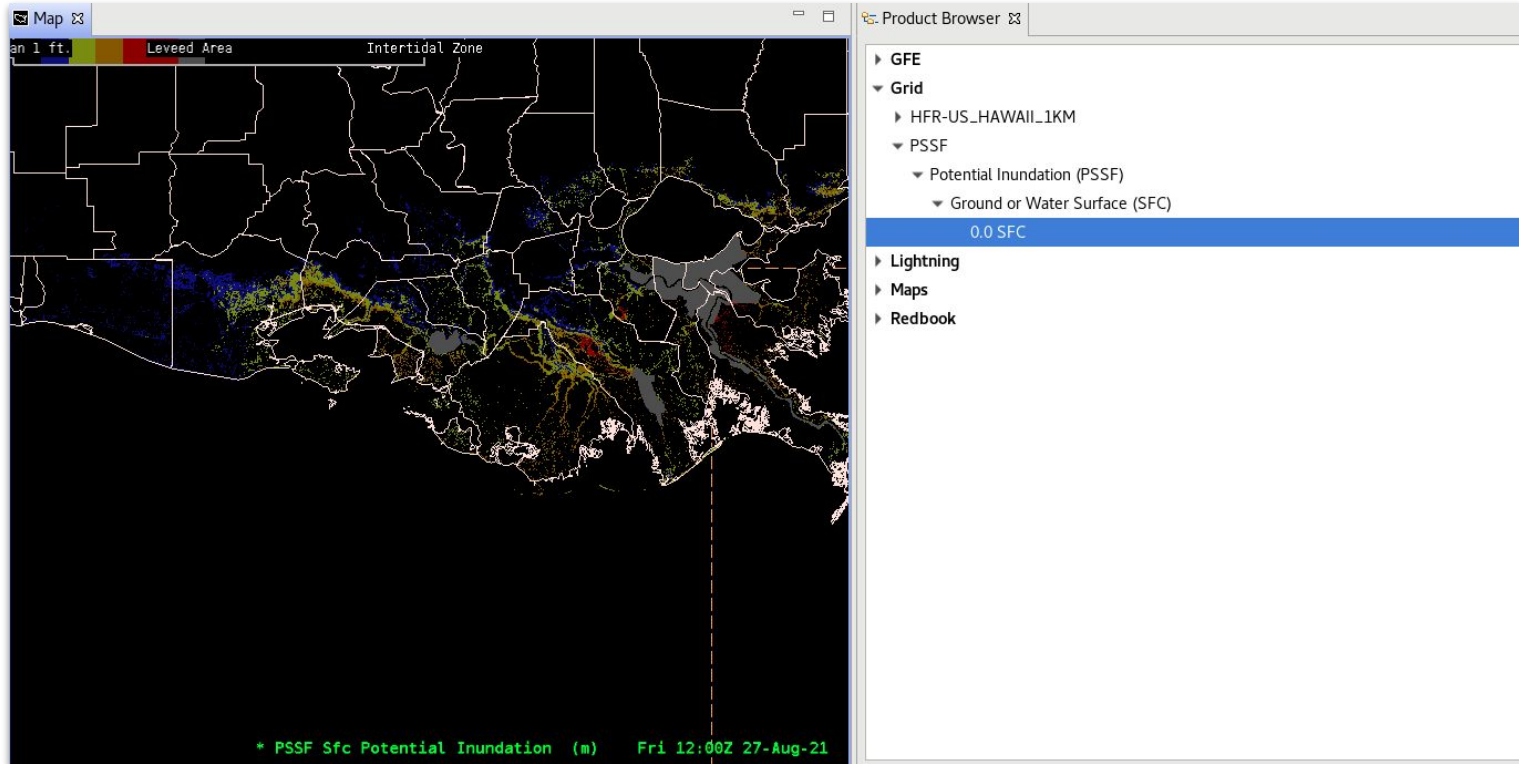
# Proposed Forecaster Workflow

Recommender run using the PSSFG as input at native resolution (100s of meters)
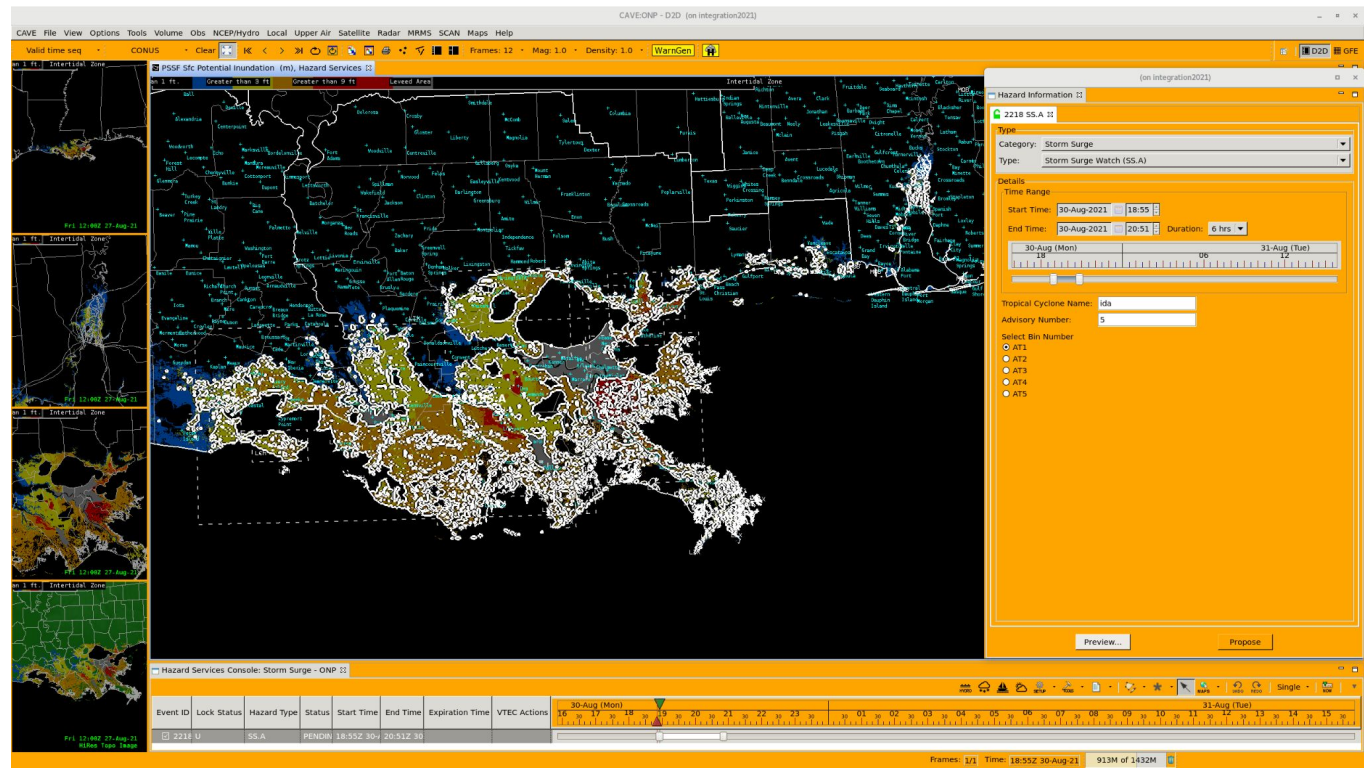
# Proposed Forecaster Workflow

First guess Watch/Warning generated from input data set (PSSFG)

Outputs Include:



1.) Common Alerting Protocol (CAP) message

2.) Legacy Text Product
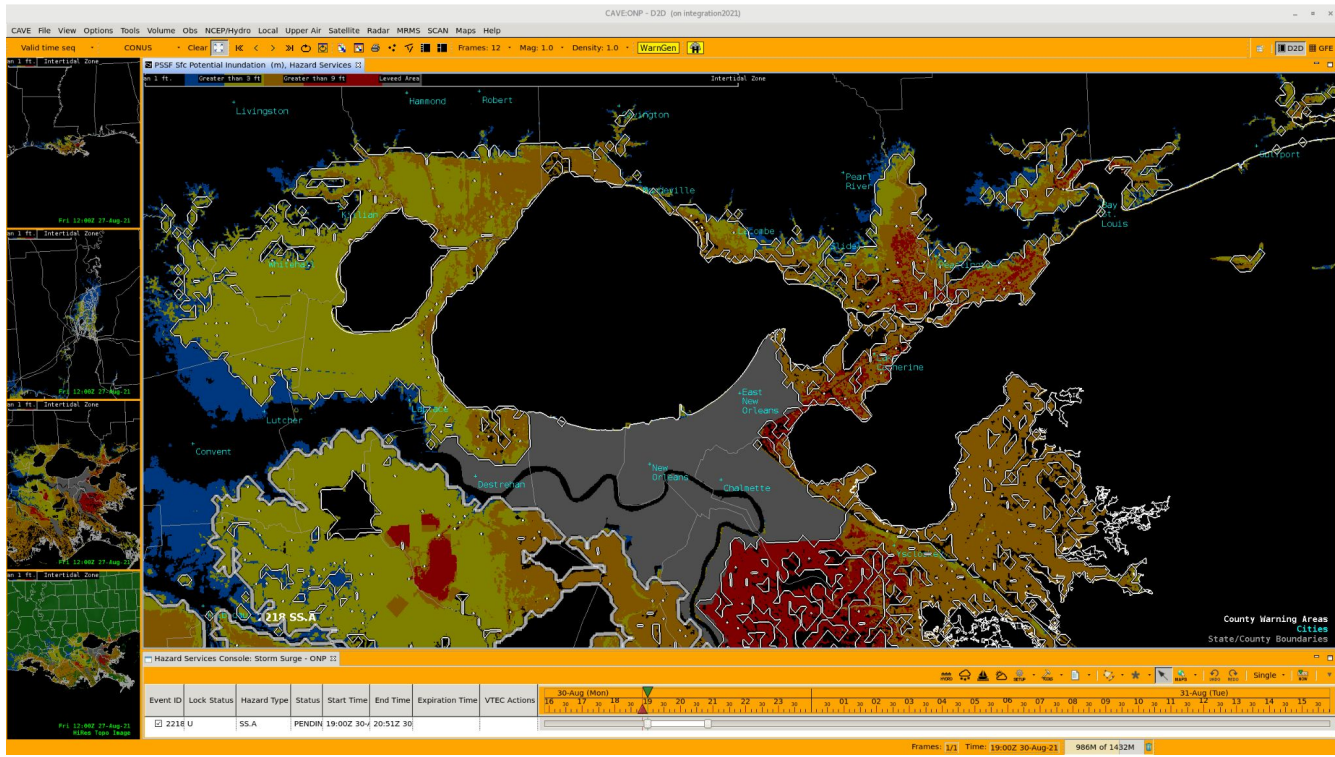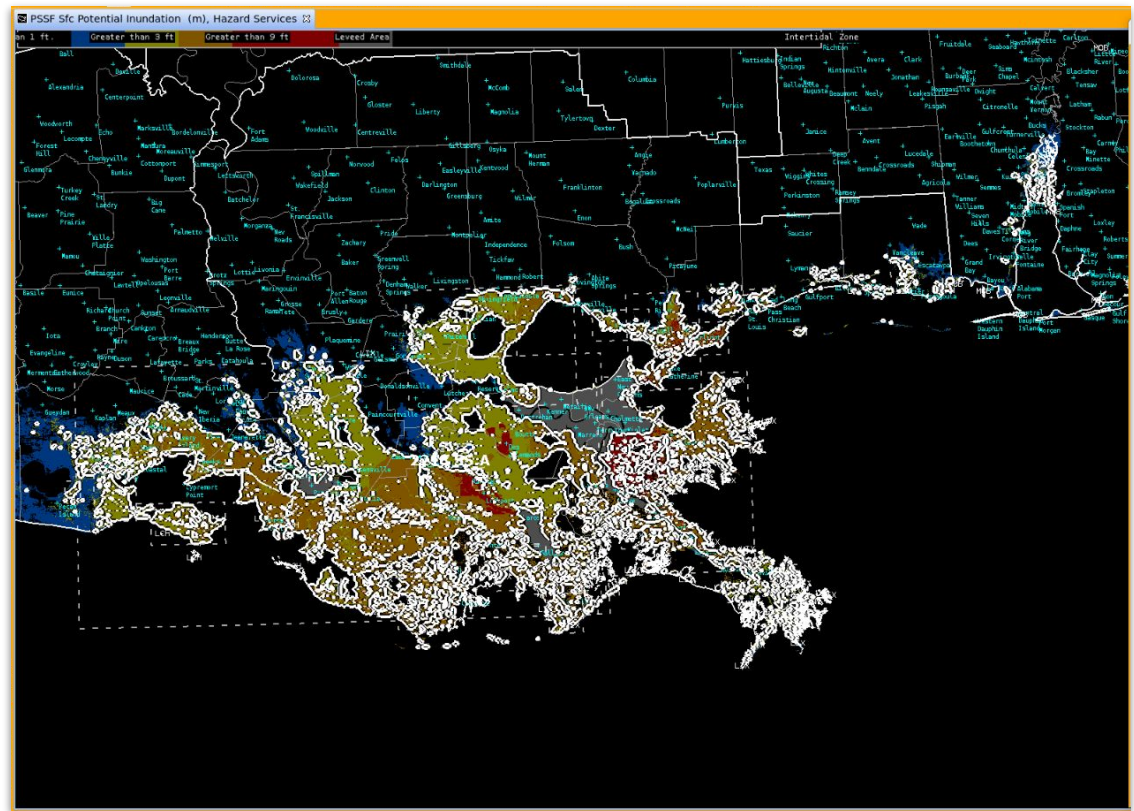
# Proposed Forecaster Workflow

Outputs Include:

3.) Storm Surge
Watch/Warning KML

- In collaboration with the National Hurricane Center
  - Hurricane Ida
- Worked with the NHC during Hurricane Ida to generate a parallel version of the Storm Surge Watch/Warning in real-time
- NHC forecaster used Hazard Services to compose the warning from Adv 05 with guidance from GSL
  - CAP message generated
  - Legacy text product generated
  - Storm Surge Watch/Warning

# Hurricane Ida

- NHC forecaster generated Storm Surge Watch/Warning in real-time using HS
- All products successfully generated

# Next Steps

- Implement tool to modify an existing hazard event via maps provided by the NHC

- Implement "punch out" tool (upgrade SS.A to SS.W)

- Continued software iteration working with NHC forecasters in real-time environment

- Host evaluation at the NHC testbed via dedicated cloud instance
  - NOT currently funded through JTTI (currently via STI)
  - Supports existing and future testbed activities

# Contact and Questions



## *Global Systems Laboratory*
### *Evaluation and Decision Support Division*
#### *Weather Information Systems Evolution (WISE)*

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